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| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
|-----------------|-------------|-------------------------------|---------------------|------------------|
| 09/975,864 | 10/11/2001 | Williams Ludwell Harrison III | 042390.P12861 | 9810 |

7590 08/13/2004

Sanjeet K. Dutta
BLAKELY, SOKOLOFF, TAYLOR & ZAFMAN LLP
Seventh Floor
12400 Wilshire Boulevard
Los Angeles, CA 90025-1026

EXAMINER

STEELMAN, MARY J

ART UNIT

PAPER NUMBER

2122

DATE MAILED: 08/13/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

| | | | |
|------------------------------|--------------------------------------|--|--|
| Office Action Summary | Application No. 09/975,864 | Applicant(s) HARRISON ET AL. | |
| | Examiner Mary J. Steelman | Art Unit 2122 | |

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 10/11/2001, 02/13/2002.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-28 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-28 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 11 October 2001 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date <u>21Feb2002</u> . | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

1. Claims 1-28 are pending.

Information Disclosure Statement

2. IDS received 21 February 2002 has been considered.

Drawings

3. The drawings are objected to because

Fig. 3, #342 should be #345. See Specification, page 17, line 9.

Fig. 5, #501, recites "STOP", should be --START--

Corrected drawing sheets are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. The figure or figure number of an amended drawing should not be labeled as "amended." If a drawing figure is to be canceled, the appropriate figure must be removed from the replacement sheet, and where necessary, the remaining figures must be renumbered and appropriate changes made to the brief description of the several views of the drawings for consistency. Additional replacement sheets may be necessary to show the renumbering of the remaining figures. The replacement sheet(s) should be labeled "Replacement Sheet" in the page header (as per 37 CFR 1.84(c)) so as not to obstruct any portion of the drawing figures. If the changes are not accepted

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by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

4. The drawings are objected to as failing to comply with 37 CFR 1.84(p)(5) because they include the following reference character(s) not mentioned in the description:

Fig. 3, #399, Fig. 4, #499, Fig. 5, #599

Corrected drawing sheets, or amendment to the specification to add the reference character(s) in the description, are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. The replacement sheet(s) should be labeled "Replacement Sheet" in the page header (as per 37 CFR 1.84(c)) so as not to obstruct any portion of the drawing figures. If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

Requirement for Information – 37 CFR 1.105

5. Applicant and the assignee of this application are required under 37 CFR 2.205 to provide the following information that the Examiner has determined is reasonable necessary to the examination of this application.

6. In response to this requirement, please provide a copy of: "MMX technology developers guide". Examiner has retrieved chapter 4 from a web location, but has been unable to locate other chapters.

7.122 Submission of Only Pertinent Pages Where Document is Large

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In responding to those requirements that require copies of documents, where the document is a bound text or a single article over 50 pages, the requirement may be met by providing copies of those pages that provide the particular subject matter indicated in the requirement, or where such subject matter is not indicated, the subject matter found in applicant's disclosure.

7.123 Waiver of Fee and Statement Requirements for Certain Information

Disclosures

The fee and certification requirements of 37 CFR 1.97 are waived for those documents submitted in reply to this requirement. This waiver extends only to those documents within the scope of the requirement under 37 CFR 1.105 that are included in the applicant's first complete communication responding to this requirement. Any supplemental replies subsequent to the first communication responding to this requirement and any information disclosures beyond the scope of this requirement under 37 CFR 1.105 are subject to the fee and certification requirements of 37 CFR 1.97 where appropriate.

7.124 Contents of Good Faith Reply

The applicant is reminded that the reply to this requirement must be made with candor and good faith under 37 CFR 1.56. Where the applicant does not have or cannot readily obtain an item of required information, a statement that the item is unknown or cannot be readily obtained will be accepted as a complete reply to the requirement for that item.

7.125 Conclusion of Requirement That Accompanies Office Action

This requirement is an attachment of the enclosed Office action. A complete reply to the

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enclosed Office action must include a complete reply to this requirement. The time period for reply to this requirement coincides with the time period for reply to the enclosed Office action.

7.127 Conclusion of Office Action That Includes Requirement

This Office action has an attached requirement for information under 37 CFR 1.105. A complete reply to this Office action must include a complete reply to the attached requirement for information. The time period for reply to the attached requirement coincides with the time period for reply to this Office action.

Claim Rejections - 35 USC § 112

7. 7.35.01 Trademark or Trade Name as a Limitation in the Claim

Claims 5, 12, 19 and 26 contain the trademark/trade name SSE. Where a trademark or trade name is used in a claim as a limitation to identify or describe a particular material or product, the claim does not comply with the requirements of 35 U.S.C. 112, second paragraph.

See Ex parte Simpson, 218 USPQ 1020 (Bd. App. 1982). The claim scope is uncertain since the trademark or trade name cannot be used properly to identify any particular material or product. A trademark or trade name is used to identify a source of goods, and not the goods themselves. Thus, a trademark or trade name does not identify or describe the goods associated with the trademark or trade name. In the present case, the trademark/trade name is used to identify/describe multimedia extensions to an instruction set and, accordingly, the identification/description is indefinite.

Claim Rejections - 35 USC § 102

8. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

9. Claims 1-3, 6, 8-10, 13, 15-17, and 22—24, and 27 are rejected under 35 U.S.C. 102(b) as being unpatentable over “MMX technology developers guide: Chapter 4 MMX™ CODE DEVELOPMENT STRATEGY” (1997).

MMX CODE DEVELOPMENT STRATEGY disclosed, in section 4.2, “Step one: Determine which code to convert.” “It is these routines that will yield the greatest performance increase when converted to the MMX™ technology optimized libraries code. Encapsulating these loops into MMX technology-optimized libraries will allow greater flexibility in supporting platforms with and without MMX technology.” A performance optimization tool...may be used to isolate the compute-intensive sections of code. Once identified, an evaluation should be done to determine whether the current algorithm or a modified one will give the best performance. In some cases, it is possible to improve performance by changing the types of operations in the algorithm. Matching the algorithms to MMX technology instruction capabilities is key to extracting the best performance.”

Section 4.3 “Is the Code Floating-Point or Integer” addresses the limitations of claims 1 and 2. “Step two: Determine whether the algorithm contains floating-point or integer data. If the current algorithm is implemented with integer data...If the algorithm contains floating-point

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data, then determine why floating point was used. Several reasons exist for using floating-point operations: performance, range and precision. If performance was the reason for implementing the algorithm in floating-point, then the algorithm is a candidate for conversion to MMX technology instructions to increase performance. If range or precision was an issue when implementing the algorithm in floating point then further investigation needs to be made. Can the data values be converted to integer with the required range and precision? If not, this code is best left as floating-point code.”

Thus, the above paragraphs address the limitations of claims 1 and 2:

Per claims 1, 8, 15 and 22:

-determining when an operation on a larger data type maybe replaced by the operation on a smaller data type having a reduced precision, wherein the operation is contained in code associated with a language implementation system; (Determine why a floating point was used, and whether an integer type (replace with a smaller data type) would be suitable)

-replacing the operation on the larger data type by the operation on the smaller data type.

(Make a candidate for MMX technology, demote to integer type.)

Per claims 2, 9, 16, and 23:

-determining when a first variable of the larger data type may be replaced by a second variable of a smaller data type having the reduced precision; (Determine why a floating point was used.)

-replacing the first variable of the larger data type by the second variable of the smaller data type.

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(Make a candidate for MMX technology, demote to integer type.)

Per claims 3, 10, 17, and 24:

-replacing the operation and replacing the first variable are used for automatic vectorization for signal and media processors that provide vector operations on small fixed-point data types.

(MMXTM CODE DEVELOPMENT STRATEGY, Section 4.7: MMX technology uses an SIMD technique to exploit the inherent parallelism of many multimedia algorithms (signal and media processors)...data should be formatted in memory according to the guidelines below...Converting this routine to MMX (replacing the operation and replacing the first variable) technology code, you would expect a four times speedup since MMX technology instruction can process four elements of the vector (vectorization) at a time using the MOVQ instruction, and perform four additions at a time using the PADDW instruction.

Per claims 6, 13, and 27:

- performing algebraic simplification on the code.

(MMXTM CODE DEVELOPMENT STRATEGY, Section 4.7: “An FIR filter is effectively a vector dot product (algebraic simplification on the code) in the length of the number of coefficient taps...”)

Claim Rejections - 35 USC § 103

10. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

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(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

11. Claims 4, 5, 11, 12, 18, 19, 20, 25, and 26 are rejected under 35 U.S.C. 103(a) as being unpatentable over MMXTM CODE DEVELOPMENT STRATEGY.

Per claims 4, 5, 11, 12, 18, 19, 25, and 26:

- the processors are MMX equipped / SSE equipped.

MMX and SSETM are instruction sets that have been added to existing architectures.

MMX instructions are SIMD for integers. SSETM instructions (Streaming SIMD Extensions) are SIMD for single precision floating point numbers. Both are used for multimedia processing.

It would have been obvious, to one of ordinary skill in the art, at the time of the invention, to have included processors with instruction set extensions, either MMX or SSETM, as the article specifically discussed demoting code for the purpose of using the extension instruction sets to increase performance.

Per claim 20:

- performing algebraic simplification on the code.

(MMXTM CODE DEVELOPMENT STRATEGY, Section 4.7: "An FIR filter is effectively a vector dot product (algebraic simplification on the code) in the length of the number of coefficient taps...")

12. Claims 7, 14, 21, and 28 are rejected under 35 U.S.C. 103(a) as being unpatentable over “MMX technology developers guide: Chapter 4 MMX™ CODE DEVELOPMENT STRATEGY”, in view of US PG Publication 2003/0188299 to Broughton et al.

The article “MMX technology developers guide: Chapter 4 MMX™ CODE DEVELOPMENT STRATEGY” disclosed code development strategies, including whether to demote code to make use of instruction set extensions.

The above mentioned article failed to disclose bitwise constant propagation. However Broughton disclosed:

-the language implementation system performs bitwise constant propagation by abstract interpretation on the code.

[0196] “The SIMD (MMX or SSE) instruction is optimized to process four-state operations...” [0202] “The bitwise AND and OR operations are three-state operations and may be performed by applying the base function to the t0/t1 bits pairwise.” [0257] “Specialization expands operations on bit fields of registers to sequences of shift, mask, and width conversion operations.” [0269] “Flow Optimizations” [0270] “The compiler may optionally perform flow optimizations as listed below. Forward flow optimizations include:” [0271] “Value and constant_propagation;” (When interpreting the code the compiler may use bitwise constant propagation.)

Therefore, it would have been obvious, to one of ordinary skill in the art, at the time of the invention to have used bitwise constant propagation when interpreting the code as it is a well known technique for optimizing code.

Conclusion

13. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.
14. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Mary Steelman, whose telephone number is (703) 305-4564. The examiner can normally be reached Monday through Thursday, from 7:00 A.M. to 5:30 P.M. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Tuan Dam can be reached on (703) 305-4552.

The fax phone number is (703) 872-9306 for regular communications and for After Final communications. Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 305-3900.

Mary Steelman



08/05/2004



WEI Y. ZHEN
PRIMARY EXAMINER